UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/580,491	05/23/2006	Horst Vestweber	14113-00012-US	2381

23416 7590 10/01/2010

CONNOLLY BOVE LODGE & HUTZ, LLP
P O BOX 2207
WILMINGTON, DE 19899

EXAMINER	
CLARK, GREGORY D	

ART UNIT	PAPER NUMBER
1786	

MAIL DATE	DELIVERY MODE
10/01/2010	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/580,491	VESTWEBER ET AL.	
	Examiner	Art Unit	
	GREGORY CLARK	1786	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 August 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-31* is/are pending in the application.

4a) Of the above claim(s) *5,6,11,23,27 and 31* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,7-10 and 12-22, 24-26 and 28-30* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 08/18/2010 has been entered.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

1. **Claims 1-4, 7-9, 13-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oshiyama (US 2003/0198831) in view of Hu (US 6,229,012).**

2. **Regarding Claim 1**, applicant claims an organic electroluminescent device (OLED) containing an anode, a cathode and an emission layer, consisting of at least one matrix material which is doped with at least one phosphorescent emitter,

characterized in that a hole-blocking layer which comprises a compound of the formula (1):

(Formula 1)

Wherein Q is N or CR and Q is at least two and a maximum of four nitrogen atoms and R can be an aromatic group. The applicant further claims a compound with NR^1 where R^1 can be a hydrogen atom.

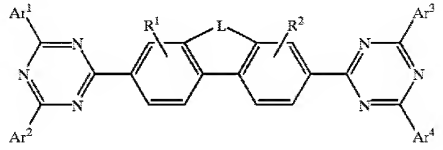
Wherein compounds of the formula (1), a 9,9'-spirobifluorene derivative, a 9,9-disubstituted fluorene derivative, a 6,6- and/or 12,12-di- or tetrasubstituted indenofluorene derivative, a tetraarylmethane derivative or a triptycene derivative is present in at least one of the radicals R, R does not contain a phenylpyridine

Oshiyama discloses an organic electroluminescent device (OLED) that contains a light emission layer (emission layer), a hole blocking layer, an anode and a cathode (paragraph 59). The light emission layer contains a host material (matrix material) and a phosphorescent compound (dopant) (abstract). The hole blocking layer can be made of materials that include pyrimidine derivatives (Q is 2) or triazine derivatives (Q is 3) (paragraph 70). The hole blocking layer is located between the light emitting layer and the cathode (paragraph 61).

Oshiyama fails to mention a pyrimidine or triazine derivative which is a 9,9'-spirobifluorene derivative, a 9,9-disubstituted fluorene derivative, a 6,6- and/or 12,12-di-

or tetrasubstituted indenofluorene derivative, a tetraarylmethane derivative or a triptycene derivative.

Hu discloses 1,3,5-triazines are materials that can be used as a hole blocking layer (column 1, lines 61-63). Hu also discloses a 1,3,5-triazine represented by Formula H-1:



Formula H-1 shows L can be a C(R'R") which corresponds to applicants' 9,9-disubstituted fluorene derivative containing 1,3,5-triazine groups. Where Q = 3 and R = heteroaromatic system.

It would have been obvious to a person of ordinary skill in the art at the time of the invention to have selected from known triazine derivatives which would have included Formula H-1 of Hu that reads on the instant limitations, absent unexpected results.

3. **Regarding Claim 2**, Oshiyama discloses that the device contains an electron transporting layer (abstract).

4. **Regarding Claim 3**, Oshiyama discloses that the OLED that has a hole blocking layer (paragraph 59) but fails to mention what percentage is present. Applicant claims at least 50% of the compounds represented by Formula 1.

Oshiyama further mentions that the hole blocking layer can efficiently accumulate holes in the light emission layer and improve a recombination probability of electrons and holes, resulting in light emission with high efficiency (paragraph 7).

With the expectation of success, a person of ordinary skill in the art at the time of the invention would have adjusted the percentage of the triazine derivative (reads on applicants' formula 1) in the hole-blocking layer to improve the recombination probability of electrons and holes, resulting in light emission with high efficiency which would have included the claimed range, absent unexpected results.

5. **Regarding Claim 4,** Oshiyama discloses that triazine derivatives can be used for the hole-blocking layer (abstract). The triazine derivatives of Oshiyama can be replaced with Formula H-1 of Hu that reads on applicants' Formula 1 as discussed above.

The examiner interprets this to mean that the hole blocking layer of Oshiyama is made only of Formula H-1.

6. **Regarding Claim 7,** Oshiyama discloses that triazine derivatives can be used for the hole-blocking layer (abstract). The triazine derivatives of Oshiyama can be replaced with the Formula H-1 of Hu that reads on applicants' Formula 1 as discussed above.

Formula H-1 shows two units of applicants' Formula 1. Applicant claims more than one unit of Formula 1.

7. **Regarding Claims 8 and 9,** Oshiyama discloses that triazine derivatives can be used for the hole-blocking layer (abstract). The triazine derivatives of Oshiyama can be replaced with the Formula H-1 of Hu that reads on applicants' Formula 1 as discussed above.

Formula H-1 shows substituents R1 and R2 which can be alkyl groups (abstract) which are sp3 hybridized rendering Formula H-1 non-planar.

8. **Regarding Claim 13,** Oshiyama discloses that triazine derivatives can be used for the hole-blocking layer (abstract). The triazine derivatives of Oshiyama can be replaced with the Formula H-1 of Hu that reads on applicants' Formula 1 as discussed above.

Hu discloses a glass transition temperature of > 100°C for Formula H-1 (column 2, line 48-52). Applicant claims the compounds of Formula 1 with a glass transition temperature of > 100°C.

9. **Regarding Claim 15,** Oshiyama discloses an OLED where a carbazole derivative is used as the host material (matrix material) (paragraph 8).

10. **Regarding Claims 16-17,** Oshiyama discloses that the phosphorescent dopant materials can be an iridium complex (contains Ir atomic number 77, per claims 16-17) (paragraph 16).

11. **Regarding Claim 14,** Oshiyama discloses that the OLED has a hole blocking layer (abstract) but fails to mention the thickness of the hole blocking layer. The applicant claims a thickness of 1 to 50nm.

Oshiyama further mentions that the hole blocking layer can efficiently accumulate holes in the light emission layer and improve a recombination probability of electrons and holes, resulting in light emission with high efficiency (paragraph 7).

It would have been obvious to person of ordinary skill in the art at the time of the invention to have adjusted the thickness of the hole-blocking layer to optimize the emission efficiency which would have included the range claimed by the applicant, absent unexpected results.

12. **Regarding Claim 18-20,** Oshiyama discloses that the layers can be made by vacuum deposition (paragraph 64) but fails to mention sublimation and printing.

Oshiyama and Hu teach the invention of claim1 but fail to teach each coating process claimed by the applicant. Whereas the applicant is claiming the OLED and not the process claims 18-20 are considered as product by process claims in which the process is not considered for patentability.

It would have been obvious to a person of ordinary skill in the art at the time of the invention to have selected from known coating methods which would have included those claimed by the applicant, absent unexpected results.

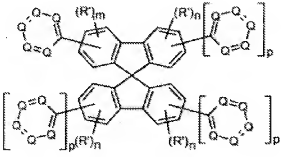
13. **Regarding Claim 21,** Oshiyama discloses an OLED used as a display device but fails to mention the devices claimed by applicant. The triazine derivatives of Oshiyama can be replaced with the Formula H-1 of Hu that reads on applicants' Formula 1 as discussed above.

Hu discloses that Formula H-1 can be used in an OLED and the OLED can be used for optoelectronic devices including photoconductive devices and the like (column 1, lines 20-25).

The photoconductive device of Hu is viewed as inclusive of the photoconductor claimed by applicant.

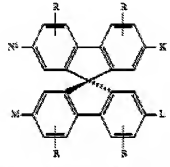
14. **Claims 22, 24-26 and 28-30 are rejected under 35 U.S.C. 103(a) as being unpatentable by Lupo (US 5,840,217).**

15. **Regarding Claims 22 and 24**, applicant claims the compound represent by Formula 2 (shown below):



Formula 4

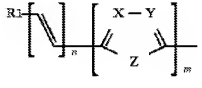
Lupo discloses formula L-1



where the symbols and indices have the following meanings:
K, L, M, N are identical or different and are

L-1

Where M-N-L-K can be represented by formula L-1c (column 2)



Formula L-1 shows R = H, n = 0, m=1, X=N, Y= N, Z is CH=N- , Formula L-1c is a 1,2,4-triazine. Applicant claims a 1,3,5-triazine.

As the triazine moiety is known in the synthetic art being the 1,2,3-triazine, 1,2,4-triazine and the 1,3,5-triazine isomers, it would have been obvious to one of ordinary skill in the art at the time of the invention to have made examples of each triazine isomeric derivative which would have included compounds containing the 1,3,5-triazine derivative which reads on the instant limitations, absent unexpected results.

Formula L-1 shows that R can be identical or different; when m=0 in applicants' Formula 2, one of the R positions in Lupo's L-1 is H (per claim 24) (column 2 lines 16-31).

Regarding Claim 25, Lupo's Formula L-1 (above) show that two triazine units can be bonded to the same fluorene sub-unit of the spirobifluorene. The obvious relationship between the 1,2,3-triazine, 1,2,4-triazine derivative and the 1,3,5-triazine derivatives was addressed above.

16. **Regarding Claim 26 and 28**, Lupo's formula L-I/L-Ic where m and n can be 1-3 (polymer) (column 3, line 27) (per claim 26). Lupo also discloses that the spiro compound can be used in an OLED (abstract) (per claim 28).

17. **Regarding Claims 29-30**, Lupo discloses that the spiro compound can be used in an OLED in a light emitting diode (column 1, line 20). An OLED is considered as inclusive of the devices claimed by applicant in claim 29

18. **Claims 1-4, 8-10 and 12-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oshiyama (US 2003/0198831) in view of Lupo (US 5,840,217).**

19. **Regarding Claims 1 and 7**, applicant claims an organic electroluminescent device (OLED) containing an anode, a cathode and an emission layer, consisting of at least one matrix material which is doped with at least one phosphorescent emitter, characterized in that a hole-blocking layer which comprises a compound of the Formula (1):

(Formula 1)

Wherein Q is N or CR and Q is at least two and a maximum of four nitrogen atoms and R can be an aromatic group. The applicant further claims a compound with NR^1 where R^1 can be a hydrogen atom.

Wherein compounds of the formula (1), a 9,9'-spirobifluorene derivative, a 9,9-disubstituted fluorene derivative, a 6,6- and/or 12,12-di- or tetrasubstituted indenofluorene derivative, a tetraarylmethane derivative or a triptycene derivative is present in at least one of the radicals R, R does not contain a phenylpyridine

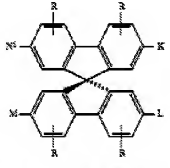
Oshiyama discloses an organic electroluminescent device (OLED) that contains a light emission layer (emission layer), a hole blocking layer, an anode and a cathode (paragraph 59). The light emission layer contains a host material (matrix material) and a phosphorescent compound (dopant) (abstract). The hole blocking layer can be made of

materials that include triazine derivatives (Q is 3) (paragraph 70). The hole blocking layer is located between the light emitting layer and the cathode (paragraph 61).

Oshiyama fails to mention triazine derivative which is a 9,9'-spirobifluorene derivative, a 9,9-disubstituted fluorene derivative, a 6,6- and/or 12,12-di- or tetrasubstituted indenofluorene derivative, a tetraarylmethane derivative or a triptycene derivative.

Lupo discloses triazine functional spirobifluorene compounds used in an OLED (abstract). Lupo further discloses that the spiro compounds can be used as charge injection or charge transport for positive (holes) charges and negative (electrons) charges (column 24, lines 35-40).

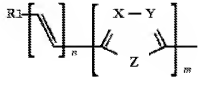
Lupo discloses 9,9'-spirobifluorene compounds represented by Formula L-1



where the symbols and indices have the following meanings:
K, L, M, N are identical or different and are

L-1

Where M-N-L-K can be represented by formula L-1c (column 2)



and R1 = H, n = 0, m=1, X=N, Y= N, Z is CH=N- which results in a 9,9' spirodifluorene triazine function compound.

Formula L-1 shows R = H, n = 0, m=1, X=N, Y= N, Z is CH=N- , Formula L-1c is a 1,2,4-triazine (3 nitrogen atoms). Applicant claims a 1,3,5-triazine.

As the triazine moiety is known in the synthetic art being, the 1,2,3-triazine, 1,2,4-triazine and the 1,3,5-triazine isomers, it would have been obvious to one of ordinary skill in the art at the time of the invention to have made examples of each triazine isomeric derivative which would have included compounds containing the 1,3,5-triazine derivative which reads on the instant limitations, absent unexpected results.

Formula L-1 shows more than one unit of applicants' Formula 1 (per claim 7).

20. **Regarding Claim 2,** Oshiyama discloses that the OLED contains an electron transporting layer (paragraph 100).

21. **Regarding Claim 4,** Oshiyama discloses that triazine derivatives can be used for the hole-blocking layer (abstract). The obvious relationship between, the 1,2,3-triazine, the 1,2,4-triazine derivatives and the 1,3,5-triazine derivatives was addressed above.

22. **Regarding Claim12,** Oshiyama discloses that triazine derivatives can be used for the hole-blocking layer (abstract). Lupo also discloses a 9,9' spirobifluorene triazine compound represented by Formula L-1/L-1a (column 2) which is exchangeable with the triazine derivatives of Oshiyama (as discussed above). The obvious relationship

between, the 1,2,3-triazine, the 1,2,4-triazine derivatives and the 1,3,5-triazine derivatives was addressed above.

23. **Regarding Claims 8-10**, The triazine derivatives of Oshiyama used in the hole blocking layer being exchangeable with the spiro compounds of Lupo was discussed above. The obvious relationship between, the 1,2,3-triazine, the 1,2,4-triazine derivatives and the 1,3,5-triazine derivatives was addressed above.

Lupo also discloses the spiro compound represented by formula L-1 and L-1a (Column 2) (above). R1 of formula L-1a can be a branched alkyl group (column 3, line 20) which is inclusive of a tert-butyl group that is non-planar (per claim 8), sp3 hybridized (per claim 9) and contains a quaternary carbon (per claim 10).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to have made a series of compounds with varied R1 groups to determine the effect on solubility and coatability which would have included a tert-butyl group that reads on the applicants' limitations, absent unexpected results.

24. **Regarding Claim 13**, The triazine derivatives of Oshiyama used in the hole blocking layer being exchangeable with the spiro compounds of Lupo was discussed above. The obvious relationship between, the 1,2,3-triazine, the 1,2,4-triazine derivatives and the 1,3,5-triazine derivatives was addressed above.

Oshiyama in view of Lupo fail to mention a glass transition temperature (Tg) for the triazine derivatives. Applicant claims a Tg of $> 100^{o}C$.

The Tg of a material is viewed as an inherent physical property of the material. As Oshiyama in view of Lupo discloses compounds which read on applicants' Formula 1, said compounds would inherently have a Tg > 100°C.

Response to Amendment

The examiner has applied new art (Hu) to some of the claims. The basis for the rejections based on Oshiyama and Lupo has changed. The examiner will respond to the arguments that are applicable based on the current set of rejections.

Applicant argues that Lupo fails to teach a 1,3,5-triazine derivative as Formula L-1/1a only shows a 1,2,4 triazine derivative.

The examiner counters that applicants' amendment limits the triazine derivative to a 1,3,5-triazine. While Lupo only shows the 1,2,4 triazine derivative, the triazine moiety is known in the synthetic art being the 1,2,3-triazine, the 1,2,4-triazine and the 1,3,5-triazine isomers, it would have been obvious to one of ordinary skill in the art at the time of the invention to have made examples of each triazine isomeric derivative which would have included compounds containing the 1,3,5-triazine derivative which reads on the instant limitations, absent unexpected results.

Applicant argues that it is known in the art that minor changes in heteroaromatic structure such as changing from a 1,2,4-triazine to a 1,3,5-triazine can have considerable effects on physical properties of a chemical compound.

The examiner counters that the isomers are each in similar electronic environments which are a fully conjugated heteroaromatic ring systems that would be

expected to have similar electronic properties. While triazine derivatives are not Lupo's preferred embodiment, generic Formula L-1/1a is inclusive of 1,2,4-triazine derivatives and the 1,3,5-triazine is considered as an obvious variant.

Moreover, Hu shows that 1,3,5-triazine groups as part of an fluorene derivative were known in the OLED art. In the absence of unexpected results that would overcome the obvious nature of changing from a 1,2,4-triazine to a 1,3,5-triazine, the claimed subject matter does not appear patentable.

The examiner also notes that non-preferred embodiments can be indicative of obviousness (see *In re Lamberti*, 192 USPQ 278 (CCPA1976); *In re Boe*, 148 USPQ 507 (CCPA 1976); *In re Kohler*, 177 USPQ 399 (CCPA 1973)), and a reference is not limited to working examples (see *In re Fracalossi*, 215 USPQ 569 (CCPA1982)). In addition, "[A] reference disclosure must be evaluated for all that it fairly teaches and not only for what is indicated as preferred." *In re Bozek*, 416 F.2d 1385 (CCPA 1969)

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to GREGORY CLARK whose telephone number is (571)270-7087. The examiner can normally be reached on M-Th 7:00 AM to 5 PM Alternating Fri 7:30 AM to 4 PM and Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Larry Tarazano can be reached on (571) 272-1515. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/D. Lawrence Tarazano/
Supervisory Patent Examiner, Art Unit 1786

GREGORY CLARK/GDC/
Examiner
Art Unit 1786